Public Health Reports

VOLUME 64 JANUARY 7, 1949 NUMBER 1

TUBERCULOSIS CONTROL ISSUE NO. 35

IN THIS ISSUE

FEDERAL SECURITY AGENCY

PUBLIC HEALTH SERVICE

FEDERAL SECURITY AGENCY
Oscar R. Ewing, Administrator

PUBLIC HEALTH SERVICE
Leonard A. Scheele, Surgeon General

Division of Public Health Methods
G. St. J. Perrott, Chief of Division

CONTENTS

Public Health Reports

Vol. 64 • JANUARY 7, 1949 • *No. 1*

—Editorial—

Tuberculosis in Mental Hospitals

If tuberculosis control is to reach its proper goal—the disappearance of tuberculosis from the United States—every reservoir of infection must be found and eliminated. One of the great sources of infection still remaining in this country may be found among inmates of mental institutions. Over and over again we have been told of the high rates of disease which prevail there. In 1946 there were 635,769 mental patients in the United States, and 4,247 of them died of tuberculosis. This is a rate of 668.0 per 100,000 in contrast to 36.4 for the general population. Deaths from tuberculosis in mental institutions comprised 8.3 percent of the total deaths from tuberculosis in the United States during that year.

We know that the disease spreads from mental institutions to the community through employees and discharged patients. Dr. Oechsli, in his paper (appearing in this issue) on tuberculosis control in California mental institutions, points out that 7,921 of the 25,810 California mental patients were paroled or discharged from parole in the year 1944–45. In the entire United States about 270,000 mental patients are coming back into the community each year. The spread of the disease from those who may have contracted tuberculosis while in mental hospitals therefore becomes a community problem which we cannot afford to ignore.

The American Trudeau Society at its meeting of June 1946 recommended that each State establish a service to control tuberculosis in mental institutions. The Society said all patients and employees should be X-rayed on admission and periodically thereafter to find the prevalence of disease in each institution. The active and probably active tuberculous patients should be segregated as soon as possible. In populous States they could be grouped in one or more institutions

This is the thirty-fifth of a series of special issues of PUBLIC HEALTH REPORTS devoted exclusively to tuberculosis control, which will appear in the first week of each month. The series began with the Mar. 1, 1946, issue. The articles in these special issues are reprinted as extracts from the PUBLIC HEALTH REPORTS. Effective with the July 5, 1946, issue, these extracts may be purchased from the Superintendent of Documents, Government Printing Office, Washington 25, D. C., for 10 cents a single copy. Subscriptions are obtainable at $1.00 per year; $1.25 foreign.

depending on the size of the problem and their multiple diagnoses. Medical and nursing service should be provided. Possibly, medical and nursing staffs of special tuberculosis centers could serve as consultants or administrators of the control program in mental institutions. Complete case reporting should be practiced, so that health departments can make follow-up examinations of the families of patients and of the patients themselves.

This program obviously should be carried out. But putting it into practice is not easy.

In the first place, mental institutions in almost every part of the country are greatly overcrowded and distressingly understaffed. Dr. Oechsli tells us that institutions in California are as much as 25 percent overcrowded. In the United States as a whole, it has been estimated that facilities fail to meet requirements by some 300,000 beds. These conditions are bound to favor the spread of the disease, to make segregation more difficult and, at the same time, more imperative. Many mental hospitals have no facilities whatsoever for the treatment of tuberculous patients. The only step the authorities can take is to establish segregated wards for them, and even this precaution is often extremely difficult to carry out, for the requirements of the patients' mental conditions have to be considered as well.

The key to the entire problem lies in the initial case-finding process. Once cases are discovered, the importance of the problem is immediately recognized, and the diagnosis of tuberculosis becomes of itself a mandate which will impel the readjustment of existing facilities to cope with the problem. With some ingenuity this can be accomplished and the institution's population will be protected.

The Hospital Survey and Construction Act recommends a minimum standard for tuberculosis beds in mental hospitals amounting to 5 percent of the total beds. Were new construction feasible, and were it possible for us to attain this standard, this would, of course, provide one simple expedient. But new building has been almost nonexistent, and priorities are going to badly needed general hospitals rather than to mental institutions.

It has been suggested that prophylaxis for mental patients might offer some palliative for the proble of tuberculosis in mental hospitals. The Public Health Service, in cooperation with State health departments, is conducting several research programs in the techniques of BCG vaccination which will eventually add to our knowledge of the preventive value of BCG. Patients in State hospitals in Georgia, Michigan, Maryland and Ohio have been X-rayed and tuberculin-tested, and those not previously sensitive to tuberculin have been vaccinated on a controlled basis. It is too early, of course, to tell whether vaccination has been effective as a preventive. We

have learned, however, that BCG vaccination among patients of mental institutions has decided limitations, because in Ohio for example, only one-quarter of the 10,000 tuberculin tested were eligible for vaccination.

On the other hand, the recommendation for case finding by X-ray of all patients and employees at intervals is now practicable. The availability of the photofluorograph makes this so. The American Hospital Association has discovered from a questionnaire sent to all its members that 154 of the mental hospitals in the United States made routine chest X-rays of all patients admitted in 1947. If a screening program is carried out in all the mental institutions, we can at least learn the magnitude of the problem, and attempts may be made to save many mental patients before infection has progressed to the active stage. Certainly the hazards of infection for employees could be materially reduced as a result of such action.

Admittedly, the elimination of tuberculosis from mental institutions is a long way off. Because of the danger to the community, as well as to patients and employees, it is necessary that we intensify our control efforts in mental hospitals. All control officers, public health officials and superintendents of mental institutions should urge that a case-finding program be adopted immediately for screening mental patients. They should also do their utmost to find ways of segregating and treating the cases found. The problem is urgent, and our solution to it must not be long delayed.

ROBT. J. ANDERSON, *Medical Director,*
Chief, Division of Tuberculosis.

Tuberculosis Control Program of Nine California Mental Institutions

Results of Initial Chest X-Ray Survey [1]

By WALDO R. OECHSLI, M. D., *Roentgenologist*

Survey of general hospital patients by X-ray is recognized as a productive field for tuberculosis case finding (*1–8*); mental institutions provide an even more productive field of investigation. The importance of the problem of tuberculosis in California mental institutions is indicated by the fact that the 25,810 resident population of the mental hospitals in the year 1944–45, forming only 0.3 percent of the population of California, contributed 4.4 percent of the deaths from tuberculosis. The death rate for tuberculosis for the seven mental hospitals and the two institutions for mental defectives, as in other States, was extremely high (table 1). The death rate of 657 per

Table 1.—*Annual average death rate per 100,000 resident population for tuberculosis (all forms) in mental hospitals and institutions for mental defectives; California, 1922–1946* [1]

Period	Mental hospitals	Institutions for mental defectives
1922–26	950	766
1927–31	813	798
1932–36	643	553
1937–41	670	422
1942–46	657	361

[1] Figures for resident population are for fiscal years and the number of deaths for calendar years.

100,000 in mental hospitals and 361 in institutions for mental defectives compares with a total tuberculosis death rate of 40.1 per 100,000 for the United States and a total tuberculosis death rate of 43.4 for California in the year 1945. Moreover, deaths from tuberculosis (1942–46) were 10 percent of the total number of deaths in the institutions, but were only slightly over 4 percent of the total deaths in the general population of California.

The problem is not confined to the tuberculous patients themselves but affects other patients, employees, relatives, friends, and the general population as well. Contrary to popular belief, there is considerable patient movement in mental institutions. For the year 1944–45, with 25,810 resident patients in 7 mental hospitals, there were 8,703

[1] From the Division of Preventive Medical Services, California State Department of Public Health. Presented before the California Tuberculosis and Health Association, Long Beach, Calif., April 1, 1948.

admissions and 3,069 returned from parole or escape. Extra-mural care is increasing. In the year 1944–45, there were 47 percent more patients on leave than in 1938. There were 5,397 patients paroled and 2,524 discharged from parole in 1944–45. It can therefore be recognized that any existing reservoir of infection in mental institutions constitutes a potential hazard both to the nontuberculous resident patients and employees, and to the population at large as well.

Overcrowding, which is widely recognized as a potent factor in the spread of tuberculosis in any environment, is a condition which probably exists in varying degrees in mental institutions everywhere. In California there have been great increases in the State's population over the years and a consequent increase in the number of patients admitted to State hospitals. The State has been unable to keep abreast of the requirements for beds for the mentally ill and it has been necessary for a number of years to admit more patients to mental hospitals than those hospitals were designed to care for. As a result, the mental hospitals were 24.5 percent overcrowded on June 30, 1945, and the institutions for mental defectives 26.9 percent overcrowded.

Recognizing the importance of the problem, Dr. Edward Kupka, Chief of the Tuberculosis Service in the California State Department of Public Health, made a study of the situation in California in 1942–43. Many patients were fluoroscoped in a number of hospitals with such productive results that the need for thorough screening was fully recognized. In 1944, by arrangements with the California Tuberculosis and Health Association, two mental hospitals were surveyed with 4″ x 5″ film, and the films were interpreted by this Department. These partial surveys revealed a prevalence of 5.7 percent new, previously unrecognized cases of tuberculosis at Napa State Hospital and 6.9 percent at Patton State Hospital.

Meanwhile, a joint program for long-range investigation had been drawn up by the Department of Public Health and the Department of Mental Hygiene, whereby all patients and employees were to be X-rayed by miniature film annually, the tuberculous patients segregated, and subsequently all new patients and new employees X-rayed with 14″ x 17″ film (*9*). In March 1946, the Department of Mental Hygiene purchased a mobile X-ray unit and from this date a continuing annual survey has been carried out.

Results—Mental Hospitals

During the first 11 months of operation 25,914 mental patients in 7 hospitals were X-rayed with 4″ x 5″ film. Of these, 2,139 or 8.25 percent, were found to have X-ray evidence consistent with pulmonary tuberculosis (table 2).

It should be pointed out that these findings were based entirely on the X-ray appearance of the lesions and are subject to revision as a result of subsequent serial X-ray examination, clinical and laboratory investigation. However, the writer shares Birkelo's opinion (*10*) that the Roentgen characteristics of tuberculous lesions are well enough established that practical dependence can be placed upon them.

The total of 2,139 cases of reinfection or adult-type pulmonary tuberculosis discovered represents previously unsuspected cases, inactive as well as active, but does not include calcified primary lesions, pleural effusions, or pleural thickening. The prevalence in individual hospitals varies considerably, ranging from 4.06 to 13.3 percent.

Table 2.—*Prevalence of previously unrecognized pulmonary tuberculosis in seven mental hospitals, found by X-ray survey; California, 1946*

Hospital	Number X-rayed	Cases	Percent
Agnews	3, 660	373	10. 2
Camarillo	4, 761	312	6. 6
Mendocino	3, 072	408	13. 3
Napa	3, 594	216	6. 0
Norwalk	2, 472	175	7. 1
Patton	3, 960	161	4. 06
Stockton	4, 395	494	11. 2
Total	25, 914	2, 139	8. 25

The variation in prevalence of tuberculosis in various mental hospitals may be affected by such factors as the age of patients at time of admission, length of residence, prevalence of tuberculosis among admitted patients, rate of transfer of tuberculosis cases to other hospitals, and rates of parole or discharge. Another highly important factor is the efficiency of the case-finding methods in use. One means of measuring case-finding activity is the ratio of cases discovered and reported during a given period to deaths from tuberculosis during the same period. This ratio was studied in five mental hospitals. Patton and Napa Hospitals were not included because recognized active tuberculosis cases had been transferred to those hospitals and the consequent tuberculosis death rate was disproportionately high. The period of study was 1941–43, previous to the surveys.

It was found that if the five hospitals were arranged in the order of their efficiency in case finding, as measured by the case-death ratio, the prevalences in the initial surveys assumed an inverse order (figure 1). In other words, the hospitals where case finding was more active before the survey, furnished the smaller number of cases remaining to be discovered by the X-ray.

A fact that unquestionably has a vital influence in the findings in figure 1 for Camarillo State Hospital, should be noted. This hospital is the only one of the five listed that had a qualified tuberculosis specialist on the staff during this period.

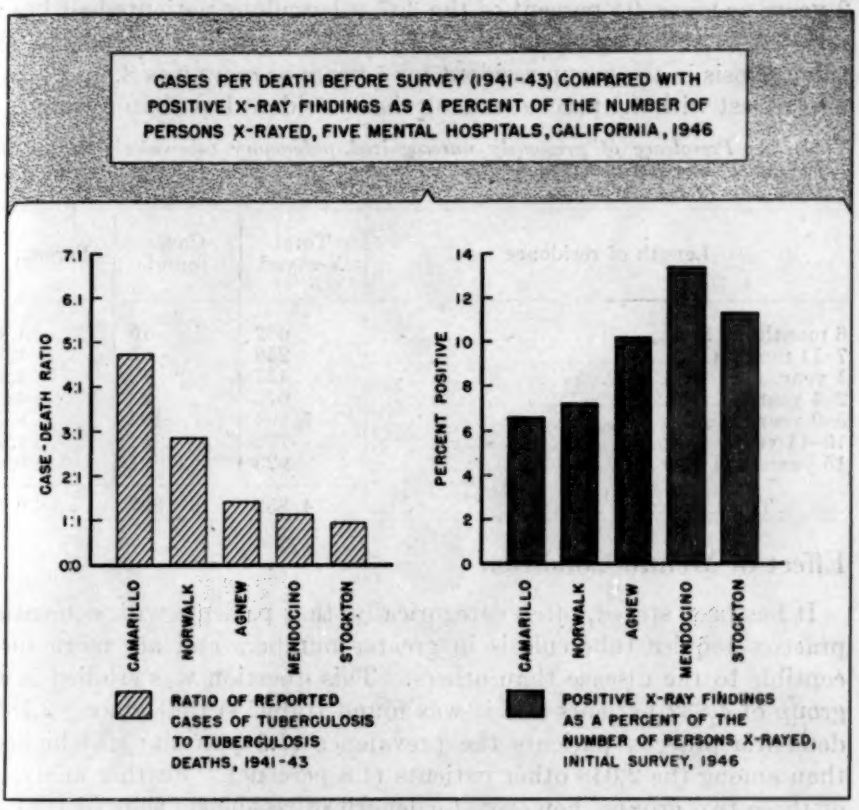

FIGURE 1

Effect of Length of Residence

The finding of more than 8 percent of mental patients with X-ray evidence of tuberculosis is similar to results in mental hospital surveys elsewhere (*11–22*), and without doubt this high prevalence grows out of two factors: (1) the introduction of tuberculosis patients into the hospital population without preliminary chest X-ray examination and without segregation, and (2) the consequent spread of the disease to others through intimate contact in an overcrowded resident population. Information regarding prevalence at the time of admission is lacking, but analysis of the data for length of residence in one hospital (table 3) throws some light on this question. Of 4,832 patients surveyed, 622 had been residents for a maximum of only 6 months and the prevalence in this group (1.6 percent) can be considered essentially the prevalence on admission. This prevalence is higher than in most

general population surveys but is about the same as that found in general hospital admissions.

With increasing length of residence the picture changes strikingly and progressively. While 72 percent of all patients had been resident 2 years or more, 94 percent of the 307 tuberculous patients had been resident in the hospital for this length of time. The prevalence of tuberculosis in the group resident for 5 years or more was 8.8 percent, in contrast with 3.0 percent among those resident less than 5 years.

Table 3.—*Prevalence of previously unrecognized pulmonary tuberculosis in mental patients of one institution found by X-ray survey, by length of residence; California, 1946*

Length of residence	Total X-rayed	Cases found	Percent
6 months or less	622	10	1.6
7–11 months	259	5	1.9
1 year	457	12	2.6
2–4 years	675	33	4.9
5–9 years	1,194	102	8.5
10–14 years	702	54	7.7
15 years and over	923	91	9.9
Total	4,832	307	6.3

Effect of Mental Condition

It has been stated, often categorically, that patients with dementia praecox acquire tuberculosis in greater numbers and are more susceptible to the disease than others. This question was studied in a group of 4,832 patients and it was found (table 4) that among 2,784 dementia praecox patients the prevalence (7.5 percent) was higher than among the 2,048 other patients (4.8 percent). Further analysis of these two groups, however, for length of residence, showed that a higher proportion of dementia praecox patients were resident over long periods of time, with consequent greater opportunity to acquire tuberculosis. Of 209 dementia praecox patients with tuberculosis, 96 percent had been resident for more than 2 years as compared to 80 percent of 98 tuberculous patients with other mental conditions.

The prevalence of tuberculosis, based on X-ray evidence, increased progressively with increase in length of residence. With the present data, however, a statistically significant difference exists in those resident 15 years or more which would indicate relatively greater prevalence among dementia praecox cases. It is unfortunate that those resident 15 years or more were not broken down into further 5-year periods. This might have shown a materially different distribution of the tuberculous in the two groups of dementia praecox cases and those with other mental conditions, with consequently a different emphasis on the relative importance of residence and mental diagnosis.

Table 4.—*Prevalence of previously unrecognized pulmonary tuberculosis in dementia praecox mental patients and in all other mental patients in one mental hospital, by length of residence; California, 1946*

Length of residence	Patients given X-ray examination									
	All diagnoses			Dementia praecox			Diagnosis other than dementia praecox			
		With tuberculosis		Total		With tuberculosis		Total		With tuberculosis	
	Total number	Number	Percent	Number	Percent distribution by length of residence	Number	Percent	Number	Percent distribution by length of residence	Number	Percent
6 months	622	10	1.6	201	7.2	1	0.5	421	20.6	9	2.1
7–11 months	259	5	1.9	109	3.9	2	1.8	150	7.3	3	2.0
12–23 months	457	12	2.6	180	6.5	5	2.8	277	13.5	7	2.5
2–4 years	675	33	4.9	333	12.0	19	5.6	342	16.7	14	4.1
5–9 years	1,194	102	8.6	729	26.2	63	8.7	465	22.7	39	8.4
10–14 years	702	54	7.7	491	17.6	40	8.1	211	10.3	14	6.6
15 years and over	923	91	9.9	741	26.6	79	10.6	182	8.9	12	6.6
Total	4,832	307	6.3	2,784	100.0	209	7.5	2,048	100.0	98	4.8

Classification of Disease

Over half the cases discovered were in the minimal stage (table 5), in contrast to about 20 percent minimal cases among those discovered before the survey as a result of clinical symptoms.

Table 5.—*Classification of previously unrecognized cases of pulmonary tuberculosis found by X-ray survey in seven mental hospitals, by hospital and stage of disease; California, 1946*

Hospital	Total cases	Minimal		Moderately advanced		Far advanced	
		Number	Percent	Number	Percent	Number	Percent
Agnews	373	227	60	121	32	25	8
Camarillo	312	158	50	124	40	30	10
Mendocino	408	226	55	150	37	32	8
Napa	216	137	63	70	32	9	5
Norwalk	175	89	51	67	38	19	11
Patton	161	89	55	58	36	14	9
Stockton	494	246	50	182	37	66	13
Total	2,139	1,172	55	772	36	195	9

There were fewer minimal cases and more far-advanced cases than are usually found in surveys of industrial groups or in the general population. The relatively greater proportion of far-advanced cases in this group of patients carries a grave epidemiological significance for other patients, the employees who care for them without knowledge of their pulmonary disease, and, in the case of those paroled or discharged, relatives and other contacts. The public health implications are emphasized when we examine the data regarding cavitation (table 6).

One-seventh of the newly discovered cases *showed evidence of cavitation* on the 14″ x 17″ film and another 5 percent had evidence which

was suspicious of cavity. Among the far advanced cases, 71 percent had cavity. *The 304 cavity cases represent more than 1 percent of the entire resident population of the hospitals.*

Table 6.—*Presence of cavitation in cases of pulmonary tuberculosis found by X-ray survey in mental hospitals, California, 1946*

Status regarding cavity	Number	Percent
Definite cavity	304	14
Suspected cavity	108	5
No cavity	1, 727	81
Total	2, 139	100

Estimate of Activity of Tuberculosis

Estimating the activity of tuberculous lesions in mentally ill patients presents much greater difficulty than in normal individuals. Sputum is rarely expectorated. Mental patients with extensive cavitation will progress to death with little or no cough or expectoration. Gastric lavage can be done only where personnel is available, and then with difficulty. Symptoms, naturally, are quite often suppressed. It is well known that tuberculous activity may persist long after body temperature becomes normal. These difficulties make it necessary to lean heavily on the information supplied by X-ray. Serial X-ray examination thus is a much more important aid in determining activity in mental patients than in normal individuals.

In order to assist the hospital staff in segregating patients as rapidly as possible an estimate of probable activity was made on the initial 14″ x 17″ X-ray film. Admittedly, under ordinary circumstances this procedure might be open to criticism and is subject to error but it seems the best way to secure rapid segregation. Serial X-ray examination and clinical investigation by sputum studies should be used to confirm or disprove the initial X-ray estimate of activity, and were so used in the mental hospitals.

Table 7.—*Estimate of activity in cases of pulmonary tuberculosis found by X-ray survey in mental hospitals in California, 1946*

Activity	Number	Percent
Probably active	1, 039	49
Questionably active	637	30
Probably inactive	463	21
Total	2, 139	100

Of the 2,139 cases for whom this information is available, practically half had lesions that were judged to be probably active (table 7). Another 30 percent presented lesions which could not be called active but which nevertheless required treatment or supervision.

Segregation

It appears clear that the cause of the high prevalence of tuberculosis in mental hospitals is failure to recognize or seek out cases of tuberculosis among incoming patients who then transmit the disease to other patients during residence in the hospital. The situation can be improved only by segregating and treating the tuberculous patients discovered by survey.

The recommendation for segregation was based on individual X-ray findings and included all except those whose lesions were judged to be inactive. It is recognized that patients without cavity and with infiltration in an intermediate stage between soft and fibrotic, may not endanger other patients by contact with them. If shortage of personnel, however, prevents following a patient closely by frequent X-rays and laboratory study, such a case may break down and become a new focus of infection, particularly among patients who cannot be depended upon to report new symptoms to their doctor.

Some years before the surveys, a policy was established whereby Napa State Hospital in the central part of the State and Patton State Hospital in the south, were designated as centers where tuberculous mentally ill patients were to be segregated and treated. These special facilities were soon filled with tuberculous patients, however, and further transfers were few. Consequently, when additional large numbers of tuberculous patients were discovered by survey, the hospital superintendents were faced with the tremendously difficult administrative problem of reshuffling their resident patients within the greatly overcrowded quarters at their command. There were also the usual requirements to be met for separating the patients according to their varying mental conditions. Considering these factors, the hospitals have complied satisfactorily in segregating their tuberculous residents. But because of lack of facilities it was not possible to segregate all of the tuberculous patients discovered by survey. Those whose tuberculosis was in a frankly communicable state were segregated. Of the group of patients whose disease appeared not to have reached an inactive, stable state, and who might therefore be potentially communicable, only part could be segregated. All of those considered to have stable, arrested lesions were left on nontuberculous wards but were checked periodically by X-ray.

A modified communicable disease technique is followed in the nursing care of the patients segregated. Many of the hospitals are not yet in a position to provide active therapy because of lack of per-

sonnel; however, there are now several hospitals with full-time tuberculosis specialists on the staff, and other personnel, such as X-ray and laboratory technicians, are being increased in numbers. Efforts are being made to get a tuberculosis specialist for each hospital.

To meet the problem of exposure of relatives and others after parole or discharge, the Department of Mental Hygiene adopted the policy of placing restrictions upon tuberculous patients leaving the hospital. Leave of absence is not granted to patients with active tuberculosis; patients with questionably active disease are granted leave only in case of emergency. Long-term parole or discharge of all tuberculous patients is permitted only when satisfactory arrangements have been made for care, preferably in a sanatorium if the disease is active. The Health Officer of the home jurisdiction is notified of all discharges of tuberculous cases.

Institutions for Mental Defectives

Two institutions are maintained in California for the care and treatment of mental defectives, epileptics, and a small number of patients committed as psychopathic delinquents. Pacific Colony receives patients from the southern part of the State and Sonoma State Home from the rest of the State.

Table 8.—*Prevalence of previously unrecognized pulmonary tuberculosis in patients of institutions for mental defectives, found by X-ray surveys, California*

Institution	Date of survey	Number X-rayed	Cases	Percent
Pacific Colony	1946	1, 654	15	0. 9
Sonoma	1944	3, 144	42	1. 3
Total		4, 798	57	1. 2

The death rate from tuberculosis among the mental defectives was not much more than half that for mentally ill patients (table 1). However, a program of annual X-ray examination for patients and employees, similar to that in mental hospitals, was carried out.

The prevalence of previously unrecognized reinfection or adult-type pulmonary tuberculosis among mental defective patients was found to be very much lower than among the mentally ill patients. Among 4,798 patients X-rayed, 57 (1.2 percent) cases were discovered (table 8). In addition to the 57 cases of reinfection-type disease, there were 10 cases of active primary (or childhood type) tuberculosis. This relatively low prevalence of 1.2 percent, as compared with 8.25 percent among the mentally ill, probably is due chiefly to the age at which residents are admitted. The median age on admission to

institutions for mental defectives in 1944–45 was 15.2, while the median age of patients admitted to mental hospitals in the same year was 45 years. The primary sources of tuberculosis in any institutional survey are the unrecognized cases of active tuberculosis admitted to the hospital. Young persons, when admitted, have a much lower prevalence of the disease. Thus, with fewer source cases, there is less transmission of the disease during residence in these institutions than in the mental hospitals. Thirty (53 percent) of the newly discovered cases were minimal and four (7 percent) far advanced (table 9), essentially the same distribution as for the mentally ill (table 5). Segregation has been carried out in these institutions as in the mental hospitals. At Sonoma State Home, active treatment with phrenic paralysis, pneumothorax, and pneumoperitoneum is being carried out.

Table 9.—*Classification of cases of pulmonary tuberculosis found by X-ray survey in two institutions for mental defectives, by hospital and stage of disease, California*

Institution	Total cases	Minimal		Moderately advanced		Far advanced	
		Number	Percent	Number	Percent	Number	Percent
Pacific Colony	15	5	33	8	54	2	13
Sonoma State Home	42	25	60	15	36	2	4
Total	57	30	53	23	40	4	7

Employees

It has been emphasized repeatedly that hospital employees, particularly nurses and attendants, run a higher risk of acquiring tuberculosis than others. In mental hospitals where the incidence of tuberculosis is several times that in general hospitals, the risk is even greater. Reports from other States show that from one to four percent of mental-institution employees contract the disease. In addition to the personal problems created by the transmission of the disease to personnel, the cost to society is considerable. The New York State Insurance Fund spent nearly $8,000 (*16*) per case for the medical care of 120 employees who acquired the disease caring for patients in mental hospitals. In California, an average of nearly $4,000, has been spent for each of 35 State employees during the past 9 years (*23*). Every effort was made, therefore, to X-ray as large a proportion of the employees of each hospital as possible. The response was very good. The results are comparable to those found in other States. Of 3,321 employees X-rayed in mental hospitals, 90 (2.7 percent) had evidence of reinfection tuberculosis (table 10). Prevalence of tuberculosis among employees working in institutions for mental defectives (1.4 percent) is less than in mental hospitals, as might be expected.

Table 10.—*Prevalence of pulmonary tuberculosis among employees of mental hospitals and institutions for mental defectives, found by X-ray survey, California, 1946*

Hospital	Number X-rayed	Cases found	Percent
Agnews	438	14	3. 2
Camarillo	565	6	1. 1
Mendocino	335	13	3. 9
Napa	699	9	1. 29
Norwalk	402	15	3. 7
Patton	517	5	. 97
Stockton	526	23	4. 4
Total	3, 482	85	2. 4
Institutions for mental defectives:			
Pacific Colony	213	2	. 9
Sonoma	211	4	1. 9
Total	424	6	1. 4

There is a well-defined relationship in prevalence of tuberculosis between patients and employees in each of the seven mental hospitals. In the hospitals showing higher prevalence among patients, there is also a higher prevalence among employees (table 11).

Table 11.— *Comparison of prevalence of pulmonary tuberculosis among patients and employees of mental hospitals as found in X-ray survey; California, 1946*

Hospital	Prevalence among patients (Percent)	Prevalence among employees (Percent)
Napa	6. 0	1. 29
Camarillo	6. 6	1. 1
Patton	4. 06	. 97
Norwalk	7. 1	3. 7
Agnews	10. 2	3. 2
Stockton	11. 2	4. 4
Mendocino	13. 3	3. 9

Conclusions

1. A tuberculosis death rate of over 600 per 100,000 resident population, in 7 California hospitals for the mentally ill, and a death rate of nearly 400 per 100,000 resident population in 2 institutions for mental defectives, indicated the same need in California as in other States for an effective program of case finding and tuberculosis control.

2. A cooperative program, formulated by the Departments of Mental Hygiene and Public Health in 1943, was initiated in 1944 with preliminary mass X-ray surveys of patients and employees. The program was placed on a continuing basis in 1946.

3. A prevalence of 8.25 percent of previously unsuspected reinfection-type pulmonary tuberculosis was discovered among 25,914 patients in 7 mental hospitals.

4. Prevalence of tuberculosis was higher among patients with dementia praecox than among those with other mental conditions. This is probably because patients with dementia praecox stay in the hospital longer and therefore have greater opportunity for exposure; however, there is statistically significant evidence that the mental state is a factor, although definitely a minor one, in the high prevalence among the mentally ill.

5. A program of segregation was put into effect. All patients with active pulmonary disease were segregated; also, some of the patients with questionably active or potentially communicable disease. Patients with inactive disease were left on nontuberculous wards but checked periodically by X-ray.

6. Among employees of mental hospitals, there was a prevalence of 2.7 percent pulmonary tuberculosis.

7. The prevalence of reinfection-type pulmonary tuberculosis in two institutions for mental defectives was 1.2 percent, much lower than among mental patients. This difference is attributed to the younger age at which mental defectives are admitted.

8. Among employees in institutions for mental defectives the prevalence was 1.4 percent.

9. In order to improve conditions in mental institutions, it is necessary to do a thorough X-ray survey of all patients, to X-ray all new admittances, and to segregate all patients with communicable tuberculosis. Such surveys must be repeated annually for a considerable period of time.

ACKNOWLEDGMENT

The author is deeply indebted to Dr. Lawrence Kolb, Medical Deputy Director of the California Department of Mental Hygiene, to his staff, and to the hospital superintendents for their understanding and cooperative spirit in furthering the execution of the purposes of the tuberculosis control program. Valuable assistance in preparing statistical material was given by R. D. Morgan, S. G. Hanks, and F. W. Oechsli.

REFERENCES

(1) Filek, A.: Case-finding possibilities in hospitals. Wisc. State Bd. of H. Quar. Bull. 7:7 (Oct.-Dec. 1944).
(2) Hilleboe, H. E.: Tuberculosis is a general problem. Mod. Hosp. 65:75–78. (1945).
(3) Plunkett, R. E. and Mikol, E. X.: Unrecognized tuberculosis in general hospitals. Am. Rev. Tuberc. 41: 381 (1939).
(4) Bauer, H., Goldsmith, H. R. and Steele, A. B.: X-ray examination of the chest in a county hospital. Calif. and West. Med. 64:29–31. (1946).

816879—49——2

(5) Scatchard, G. N. and Duszynski, D. O.: Miniature chest X-ray in general hospitals. J. A. M. A. **127:** 746 (1945).
(6) Childress, W. G.: Debbie, A. G. and Harmon, E. L.: Tuberculosis case finding by general hospitals. J. A. M. A. **122:** 1063 (1942).
(7) Pollak, M.: General hospitals join the fight to eradicate tuberculosis. Mod. Hosp. **66:** 75. (1946).
(8) Oatway, W. H., Jr.: T. B. search in hospitals. N. T. A. Bull. **31:** 165 (1945).
(9) Report of the committee on tuberculosis in mental hospitals. Am. Rev. Tuberc. **54:** 448 (1946).
(10) Birkelo, C. C. and Rague, P. O.: Accuracy of roentgen determination of activity of minimal pulmonary tuberculosis. Am. J. Roentgenol. **60:** 303 (1948).
(11) McGhie, B. T. and Brink, G. C.: A tuberculosis survey in mental hospitals. Am. J. Psychiat. **13:** 975 (1934).
(12) Burns, H. A.: A study of the incidence of tuberculosis in State institutions in Minnesota. Am. Rev. Tuberc. **33:** 813 (1936).
(13) Pollak, M., Turow, I. and Kurth, M.: Tuberculosis survey of the Peoria State Hospital. Ill. Med. J. **73:** 481 (1938).
(14) Pollak, M., Hummel, A. V. and Turow, I. L.: Tuberculosis in mental hospitals. Am. Rev. Tuberc. **43:**373 (1941).
(15) Ruskin, D. B.: Epidemiology of tuberculosis in a mental hospital. Am. Rev. Tuberc. **52:** 248 (1945).
(16) Hilleboe, H. E., Haas, R. B. and Gardner, W. P.: Tuberculosis case finding in institutional populations. Am. J. Pub. Health **32:** 516 (1942).
(17) Deegan, J. K., Culp, J. E. and Beck, F.: Epidemiology of tuberculosis in a mental hospital. Am. J. Pub. Health, **32:** 345 (1942).
(18) Katz, J., Plunkett, R. E. and Thompson, M. E.: Prevalence of pulmonary tuberculosis in New York State institutions for the mentally ill. Psychiatric Quart. **19:** 644 (1945).
(19) Sherman, G. A.: Five year review of Michigan's X-ray service. Mich. Pub. Health. **34:** 123 (1946).
(20) Garry, M. W.: Tuberculosis in mental schools and hospitals in Ohio. Ohio Pub. Health. **10:** 1 (1946).
(21) Williams, C. L.: Tuberculosis in mental institutions. Hossier Health Herald, **28:** 61 (1947).
(22) Russakoff, A. H.: Tuberculosis in the Alabama State hospitals. Am. Rev. Tuberc. **55:** 93 (1947).
(23) Personal communication: Calif. State compensation insurance fund.

Tuberculin, Coccidioidin, and Histoplasmin Sensitivity in Relation to Pulmonary Calcifications

A Survey Among 6,000 Students at the University of Chicago [1]

By William G. Beadenkopf, *Assistant Professor of Medicine*, Clayton G. Loosli, *Associate Professor of Medicine*, Herbert Lack, *Assistant Professor of Roentgenology*, Frederick A. Rice, *Assistant in Medicine*, and Robert V. Slattery, *Assistant in Medicine*

Since 1942, the association of coccidioidin and histoplasmin sensitivity with pulmonary calcification (*1*, *2*, *3*, *4*) has introduced new emphasis to the evaluation of such calcifications. The high prevalence of pulmonary calcifications in the Middle West (*5*), and the high prevalence of histoplasmin sensitivity in the same general region (*6*, *7*) have suggested a need for re-assessing the etiology of these calcifications. In view of the evidence that histoplasmosis and coccidioidomycosis may be etiologically associated with pulmonary calcification, these antigens were included among the skin tests given as part of the tuberculosis control program at the University of Chicago.

This procedure also provided a means of estimating the prevalence of coccidioidin and histoplasmin sensitivity among persons from areas which have not yet been extensively surveyed (*6*). Because of the wide area from which they are drawn, the students at the University of Chicago are a convient source of information on the geographical variations of the incidence of histoplasmin, coccidioidin, and tuberculin sensitivity in relation to pulmonary calcification and chest diseases. Only 30 percent of the 9,000 students enrolled come from Chicago and vicinity; the greater number are drawn from practically all parts of the United States, and several hundred are from foreign countries.

Methods

The present report is based on the study of 6,000 students registered at the University from January 1 to October, 1947. The study was incorporated in a tuberculosis control program set up for about 9,000 students who were enrolled during this period. More than 6,300 persons were examined but because of incomplete or otherwise unsatisfactory records, about 300 were excluded from this analysis. The remaining 6,000 represent those examined routinely at the time of registration within the study period, others who reported to the clinic

[1] From the Department of Medicine, School of Medicine, and the Student Health Service, the University of Chicago. This investigation was supported (in part) by a research grant from the Division of Research Grants and Fellowships of the National Institute of Health, Public Health Service.

for various reasons during that time, and a third group who were solicited or who had heard about the program by other means and volunteered to become a part of the study group.

Each student reporting for examination was directed to fill out, under supervision, a questionnaire punch card. He was asked where he had lived and what places he had visited for periods of 6 months or longer, and what places he had visited for shorter periods of time. He was also asked what diseases he had had or had come in contact with. A systematic review was made of his past illnesses.

After completing the questionnaire, the student was given skin tests with tuberculin,[2] coccidioidin,[3] and histoplasmin,[4] administered intracutaneously in 0.1 cc. doses, each in particular areas of the forearms. Each set of syringes and needles was used for only a single antigen (*8,9*). The tuberculin used was 0.0001 mg. PPD (*10*); the coccidioidin (*2,9,11*) and histoplasmin (*12,3*) were 1–100 dilutions of sterile filtrates of broth cultures of the fungi, as recommended by the persons who provided the antigens. The student was instructed to report back for skin test interpretations in either 48 or 72 hours, whichever was convenient. At that time the diameters of both the erythema and the induration of the reactions were measured (*13*). Both the injections and the readings of the skin tests were done by one of three persons.

After the injections of the skin test antigens, the student was sent to the microfilm room for chest X-ray. A single film chest X-ray was taken on a Picker 70 mm. Minograph machine and exposures were timed automatically with a Hodges-Morgan type of photo-electric timer. The films were read by one of the authors (Lack) on a General Electric fluorescent viewer, without knowledge of skin test reactions, for the purpose of determining the presence or absence of calcification. This information, together with a description of any other significant chest disease or extra-pulmonary lesion, was recorded on the punch card.

A skin reaction was considered positive if the induration measured 5 mm. or more in diameter, regardless of erythema. A doubtful reaction was defined as one showing 1 to 4 mm. of induration, regardless of erythema. Doubtful tuberculin reactions occurred in 1.4 percent of the total group, doubtful coccidioidin reactions in 0.6 percent, and doubtful histoplasmin reactions in 1.4 percent. These doubtful reactions were considered negative in the analysis that follows (*6*).

Ten percent of the films showing pulmonary calcifications were interpreted as doubtful. These, however, were included with the definite calcifications in accordance with the analyses of others (*4,14*).

---

[2] Supplied by Sharpe & Dohme, Philadelphia, Pa.
[3] Supplied by Dr. Charles H. Smith, Stanford University School of Medicine, Palo Alto, Calif.
[4] Supplied by Drs. Amos Christie & J. C. Peterson, Vanderbilt University, Nashville, Tenn.

Results

Prevalence of sensitivity.—The age and sex distribution of the study population is given in table 1. Approximately 55 percent of the entire group were below age 25; 25 percent were in the 25- to 29-year group, and approximately 10 percent, 5 percent, and 2½ percent, respectively, fell in the older age groups. In the 20–34 year age groups, the

Table 1.—*Distribution of study population by age and sex*

Age in years	Total		Male		Female	
	Number	Percent	Number	Percent	Number	Percent
15–19	1,156	19.3	690	59.7	466	40.3
20–24	2,137	35.6	1,565	73.2	572	26.8
25–29	1,503	25.1	1,198	79.7	305	20.3
30–34	615	10.2	454	73.8	161	26.2
35–39	284	4.7	152	53.5	132	46.5
40–44	155	2.6	63	40.6	92	59.4
45 and over	150	2.5	45	30.0	105	70.0
All ages	6,000	100.0	4,167	69.5	1,833	30.5

males outnumber the females approximately three to one, while the females predominate in the oldest year groups. Table 2 shows that the over-all prevalence of tuberculin sensitivity was 26.1 percent; of coccidioidin sensitivity, 4.1 percent; and of histoplasmin sensitivity, 20.2 percent. Of the 6,000 persons tested, 59.5 percent reacted to none of the three antigens.

Table 2. *Prevalence (percent) of tuberculin, coccidioidin, and histoplasmin sensitivity among 6,000 students by sex and age*

Age in years	Tuberculin		Histoplasmin		Coccidioidin		Nonreactors	
	Male	Female	Male	Female	Male	Female	Male	Female
15–19	11.0	7.9	11.0	9.0	2.2	1.3	79.1	83.7
20–24	20.4	17.1	19.7	13.1	3.9	1.6	63.4	72.4
25–29	29.6	31.8	25.0	20.0	6.0	4.9	52.2	53.8
30–34	45.6	42.9	28.2	23.6	6.2	2.5	38.1	41.6
35–39	56.6	40.9	32.2	22.7	10.5	.8	25.0	45.5
40–44	60.3	54.4	44.4	32.6	1.6	5.4	20.6	32.6
45 and over	64.4	46.7	51.1	24.7	11.1	8.6	24.4	40.9
All ages	26.1		20.2		4.1		59.5	

The prevalence of sensitivity to the three antigens in relation to age is shown in figure 1. In general, the prevalence of sensitivity to all antigens appears to increase stepwise with age. The oldest age group (45 years and older) does not shown an increase for tuberculin or histoplasmin. This departure from the trend is accounted for by the low prevalence of sensitivity among females in this age group and the fact that the number of females is disproportionately large.

Prevalence in relation to sex.—In table 1, the number of males was seen to be approximately three times the number of females in groups

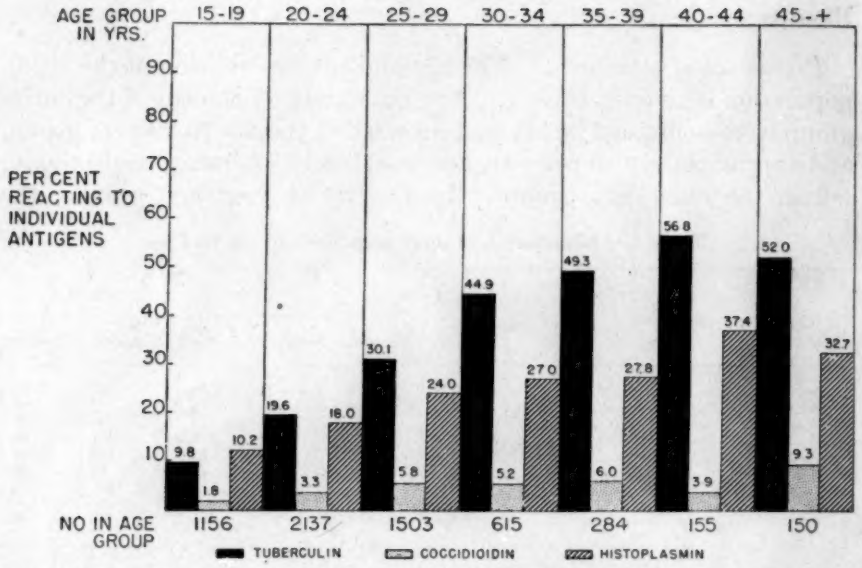

Figure 1. Prevalence of tuberculin, coccidioidin, and histoplasmin sensitivity in relation to age among 6,000 students.

from 20 to 34 years. A slight but consistently higher prevalence of sensistivity to the three antigens was found among males in all age groups (table 2) except those in the age group 25–29 for tuberculin, and those in the group 40–44 for coccidioidin. However, the differerences between males and females in these last two groups are not significant.

Prevalence of sensitivity to one or more antigens.—Groups of reactors were analyzed according to whether they reacted to a single antigen or to combinations of antigens. Table 3 gives the prevalence of the reactions by age. The percentage of reactors to tuberculin alone showed a stepwise increase with age to approximately the 40-year level, but the percentage reacting to histoplasmin alone did not

Table 3.—*Prevalence of tuberculin and histoplasmin reactions and their combinations among 6,000 students by age*

Age in years	Tuberculin		Tuberculin and histoplasmin		Histoplasmin		Nonreactors	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
15–19	91	7.9	18	1.6	90	7.8	936	80.9
20–24	332	15.5	69	3.2	259	12.1	1,407	65.8
25–29	333	22.2	90	6.0	204	13.6	789	52.5
30–34	201	32.7	61	9.9	81	13.2	240	39.0
35–39	102	35.9	32	11.3	35	12.3	98	34.5
40–44	53	34.2	31	20.0	22	14.2	43	27.8
45–49	17	21.8	11	14.1	9	11.4	31	39.7
50 and over	25	34.7	16	22.2	4	5.6	23	31.9
All ages	1,154	19.2	328	5.5	704	11.7	3,567	59.5

NOTE: The above table accounts for 95.9 percent of the students tested. The remaining 4.1 percent comprise: 27 tuberculin-coccidioidin reactors (0.5 percent), 56 tuberculin-coccidioidin-histoplasmin reactors (0.9 percent), 37 coccidioidin reactors (0.6 percent), and 127 coccidioidin-histoplasmin reactors (2.1 percent).

continue to increase appreciably after age 29. The percentage of the total group that reacted to both tuberculin and histoplasmin, however, increases rapidly to the 44-year level. This probably explains the increase of the total histoplasmin sensitivity by age which was noted in table 2.

Prevalence of sensitivity in relation to pulmonary calcifications.—The individuals who reacted to each antigen, to combinations of the antigens, and nonreactors were studied to determine the relationship to pulmonary calcification. The prevalence of calcification in each of the seven reacting groups and the nonreacting group is shown in table 4. The over-all prevalence was 13.3 percent. The histoplasmin reactors showed 29 percent with calcification, double that of the tuberculin reactors (14 percent); while the coccidioidin reactors were intermediate in position (19 percent). The calcification rate recorded for coccidioidin reactors is not reliable, however, because of the small number reacting to coccidioidin. The group reacting to

Table 4.—*Prevalence of calcification and sensitivity to individual antigens and to combinations of antigens*

Antigens	Reactions among 6,000		With calcification		Percent reactors among 800 with calcification
	Number	Percent	Number	Percent	
Tuberculin	1,154	19.2	162	14.0	20.3
Tuberculin-coccidioidin	27	.5	5	18.5	.6
Tuberculin-histoplasmin	328	5.5	93	28.4	11.6
Tuberculin-coccidioidin-histoplasmin	56	.9	21	37.5	2.6
Coccidioidin	37	.6	7	18.9	.9
Coccidioidin-histoplasmin	127	2.1	38	29.9	4.8
Histoplasmin	704	11.7	205	29.1	25.6
Non-reactors	3,567	59.5	269	7.5	33.6
Total	6,000	100.0	800	13.3	100.0

both tuberculin and histoplasmin showed a calcification rate (28.4 percent) approximately the same as the group reacting to histoplasmin alone. The highest rate of calcification was encountered among those reacting to all three antigens, 21 of 56 persons, or 37.5 percent. However, due to the small size of the group, this rate of calcification is significantly different only from the rate among the tuberculin reactors (14 percent) alone. The prevalence of pulmonary calcifications among the nonreactors was 7.5 percent.

Table 4 also gives the proportional distribution of the 800 students who showed pulmonary calcifications by skin sensitivity groups. Of those showing calcification, 26 percent reacted to histoplasmin, 20 percent to tuberculin, 12 percent to both tuberculin and histoplasmin, 5 percent to both coccidioidin and histoplasmin, and the remaining 4.0 percent reacted to coccidioidin alone or in combination with tuberculin or to all three antigens. Approximately one-third of those showing pulmonary calcifications, however, reacted to none of the

three antigens. It will be noted from figure 2 that the prevalence of pulmonary calcification in nonreactors almost doubles from the youngest to the oldest age group under study.

The relation of age to the prevalence of pulmonary calcifications.—The prevalence of calcification in relation to age was examined among the major reacting groups and is illustrated graphically in figure 2. The largest variation in prevalence of calcification among tuberculin reactors was from the 15–19 year age group to the 20–24 year age

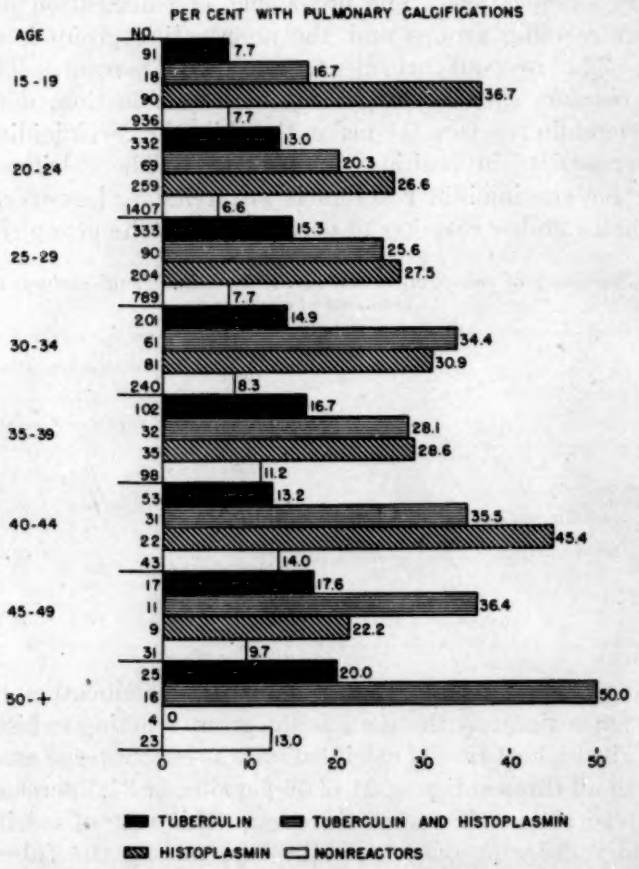

Figure 2. Prevalence of pulmonary calcifications in relation to age among the major reacting groups and among nonreactors from a survey of 6,000 students (see table 3).

group; 7.7 percent to 13.0 percent respectively. While the variation by age is not as remarkable in the older groups, nevertheless there seems to be a gradual and somewhat irregular increase in prevalence of calcification among tuberculin reactors with increasing age, with the highest prevalence shown in the oldest group. The calcification rate among those reacting to histoplasmin alone was high in the youngest group (36.7 percent) and more than double the rate observed among those reacting to both tuberculin and histoplasmin, although the

latter group is unreliable as a sample because it contains only 18 persons. There seemed to be a tendency, where the groups were large enough for comparison, toward a lower prevalence of calcification among reactors to both tuberculin and histoplasmin than among reactors to histoplasmin alone. The nonreactors consistently showed the lowest rate of calcifications except in a few groups where the differences are not significant.

Geographical variations in prevalence of tuberculin and coccidioidin sensitivity.—An attempt was made to determine all the places in which a student had lived and traveled and the duration of his stay in each. From this information, an approximation of the time spent in any given locality was reached according to a variation of the method used by Palmer (*6*). For purposes of this analysis, a student who

Table 5.—*Prevalence of sensitivity to each antigen and of calcification by geographic area*

Region or area	Number tested	Tuberculin		Histoplasmin		Coccidioidin		With calcification	
		Number	Percent	Number	Percent	Number	Percent	Number	Percent
United States:									
East North Central	2,821	593	21.0	594	21.1	117	4.1	374	13.3
Middle Atlantic	714	186	26.1	67	9.4	18	2.5	65	9.1
West North Central	538	119	22.1	187	34.8	25	4.6	103	19.1
South Atlantic	281	83	29.5	58	20.6	9	3.2	36	12.8
New England	205	71	34.6	15	7.3	0	0.0	12	5.9
Pacific	205	40	19.5	23	11.2	14	6.8	18	8.8
West South Central	203	50	24.6	76	37.4	16	7.9	31	15.3
East South Central	144	41	28.5	76	52.8	11	7.6	29	20.1
Mountain	132	30	22.7	8	6.1	12	9.1	10	7.6
Wanderers	285	92	32.3	77	27.0	16	5.6	57	20.0
Total U. S	5,528	1,305	23.6	1,181	21.4	238	4.3	735	13.3
Europe	164	92	56.1	9	5.5	4	2.4	19	11.6
Canada and Alaska	110	37	33.6	8	7.3	4	3.6	11	10.0
China	57	55	96.6	1	1.8	0	0.0	15	26.3
Asia except China	33	17	51.5	1	3.0	0	0.0	8	24.2
Other foreign	108	59	54.6	15	13.9	1	0.9	13	12.0
Total foreign	472	260	55.1	34	7.2	9	1.9	66	14.0

spent 50 percent or more of his life in one State or one foreign country was considered to be "from" or a "life-time resident" of that State or country. The 6,000 individuals studied were thus classified geographically with the exception of 285 persons who had spent less than 50 percent of their lives in any one State or country. This latter group was labelled "wanderers" and treated as though it constituted a single geographic unit. The geographical distribution of the students varied widely, as is seen in table 5. They ranged in number from 132 in the Mountain States region to 2,821 in the East North Central States, although the samples from 30 individual States contained less than 50 persons. In addition, there were 472 foreign students.

The prevalence of tuberculin sensitivity throughout the several regions of the United States varied from 19.5 percent to 34.6 percent. When the States were studied separately, insofar as the size of the

samples permitted, there seemed to be no tendency for the States of either high or low prevalence to predominate in one section of the country. Examination of the rates by sex showed as many States with higher prevalence among females as among males. The rate for the "wanderers" (32 percent) was slightly below the highest prevalence noted in any section of the country.

Table 6.—*Coccidioidin sensitivity among 5,243[1] students from certain regions[2] of the United States, by sex*

Region	Males			Females		
	Number			Number		
	Tested	Positive	Percent positive	Tested	Positive	Percent positive
I	55	4	7.3	21	0	0
II	35	0	0	20	0	0
III	345	18	5.2	165	1	.6
IV	170	19	11.2	76	8	10.5
V	2,145	111	5.2	940	35	3.7
VI	191	8	4.2	102	0	0
VII	256	0	0	114	0	0
VIII	449	17	3.8	160	1	.6

[1] Residents of United States.
[2] See figure 3.

The prevalence among foreign students was significantly higher than among Americans—55.1 as opposed to 23.6 percent. Eighty percent of students from Asia reacted to tuberculin, among whom those from China (57 persons) showed a rate of 96.6 percent. The rate for stu-

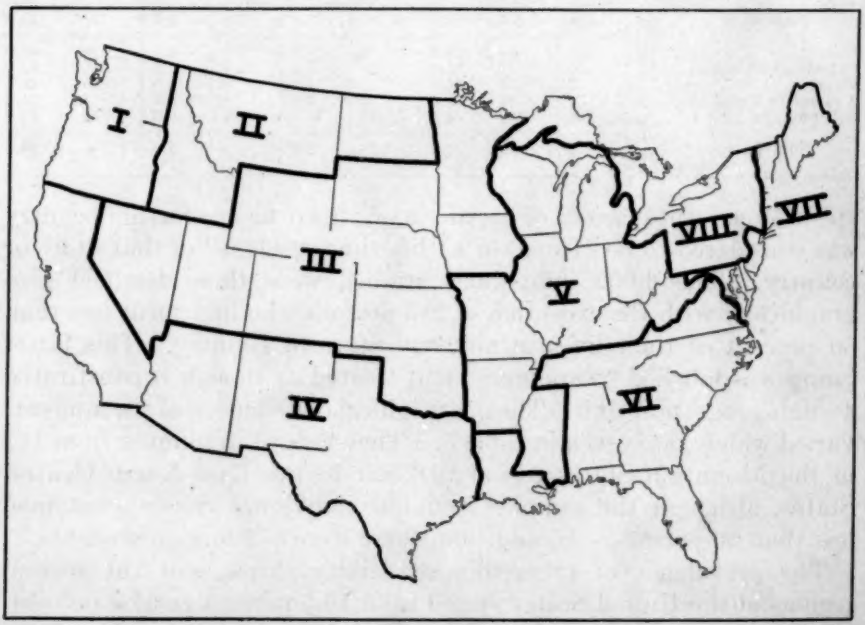

Figure 3.

dents from Europe was 56.1 percent, and the rate for those from Canada and Alaska was 33.3 percent, which is very near that of the New England States.

The pattern for the geographic distribution of the prevalence of coccidioidin sensitivity is not clear cut. From the rates obtained in several sections of the country, it seems probable that the picture is complicated by the occurrence of a cross reaction between the two fungus antigens employed (histoplasmin and coccidioidin). It may be that the strength of these antigens was too great. In general, two areas seem higher than the average, one in the Southwest and one in the Midwest and Midsouth, the latter being the region of highest histoplasmin sensitivity (table 6). Males showed a slightly higher rate of sensitivity than females throughout the United States, excepting the Southwest, where the rates were the same.

Geographical distribution of histoplasmin sensitivity.—In contrast to the scattered geographical variations in the prevalence of tuberculin sensitivity, the prevalence rates of histoplasmin sensitivity and of pulmonary calcifications showed a marked tendency to centralize in one section of the United States.

In appendix tables A and B, the prevalence rates of histoplasmin sensitivity and of pulmonary calcification are given for individual States where the sample comprised 20 persons or more. The geo-

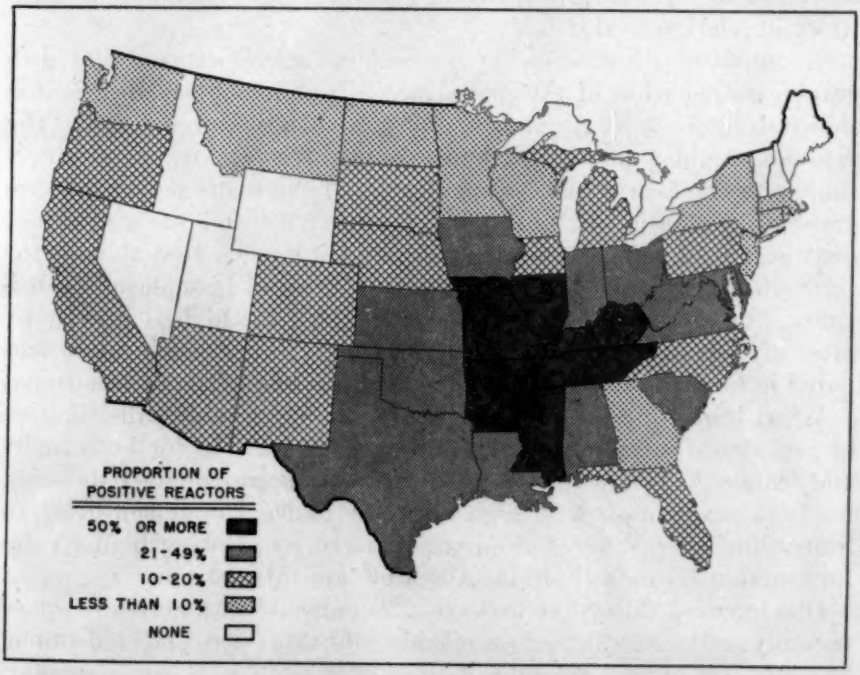

Figure 4. Histoplasmin sensitivity rates observed in University of Chicago students from certain States and groups of States, 1947

graphic distribution of the prevalence of histoplasmin sensitivity, using the data from appendix table A, is shown graphically in figure 4. It can be seen readily that the prevalence rates of histoplasmin sensitivity reveal an endemic region in the Lower Mississippi Basin.[5] The prevalence is considerably higher among the students from this region than among those coming from the Mountain States and New England, and appreciably higher than among those coming from contiguous regions. Those coming from Mississippi had the highest prevalence rate, 70 percent. However, only 20 students were tested from this State. The second highest rate (69.7) was observed in Missouri, where 132 students were tested. The rate of 7 percent histoplasmin sensitivity among the students coming from the relatively nonendemic areas was essentially the same as the average rate among the foreign students as a whole but was higher than among those coming from Asia (2.2 percent), who had the highest prevalence of tuberculin sensitivity.

An analysis of the data of appendix table A giving histoplasmin sensitivity according to sex showed the same general geographic distribution for each sex. A higher prevalence of histoplasmin reactors was found among males than among females in nearly all States, and, in the United States in general, males showed an unquestionably higher rate. On the other hand, there was not a significant difference in regional prevalence of tuberculin and coccidioidin sensitivity in relation to sex.

Geographical distribution of pulmonary calcifications.—The geographic distribution of the prevalence of pulmonary calcifications is shown in figure 5, by regions of similar calcification prevalence. The rate was highest among students coming from a region strikingly similar to the Lower Mississippi Basin. If the maps giving the geographic distribution of histoplasmin sensitivity and the geographic distribution of calcification are compared it can be seen that of the six States having the highest prevalence rates of histoplasmin sensitivity, five are among those States that show the highest prevalence rates of pulmonary calcification. Conversely, little calcification was noted in films of persons from regions of low histoplasmin sensitivity.

When broken down according to sex, the geographical distribution of prevalence rates retains the same general pattern for both males and females. The rates in most States were approximately the same for both sexes or slightly higher for the males. Four southeastern States, however, differed from this pattern by showing higher rates for females: Georgia, Florida, Alabama, and Mississippi.

One hundred thirty-five persons (2.25 percent) with active or questionably active noncalcified pulmonary infiltrates were detected among

[5] The term, Lower Mississippi Basin, is used to include the general area drained by the Mississippi and Ohio Rivers but only the small lower portion of the area drained by the Missouri River. This, in general, is the area referred to by others as eastern central United States (*5, 6*).

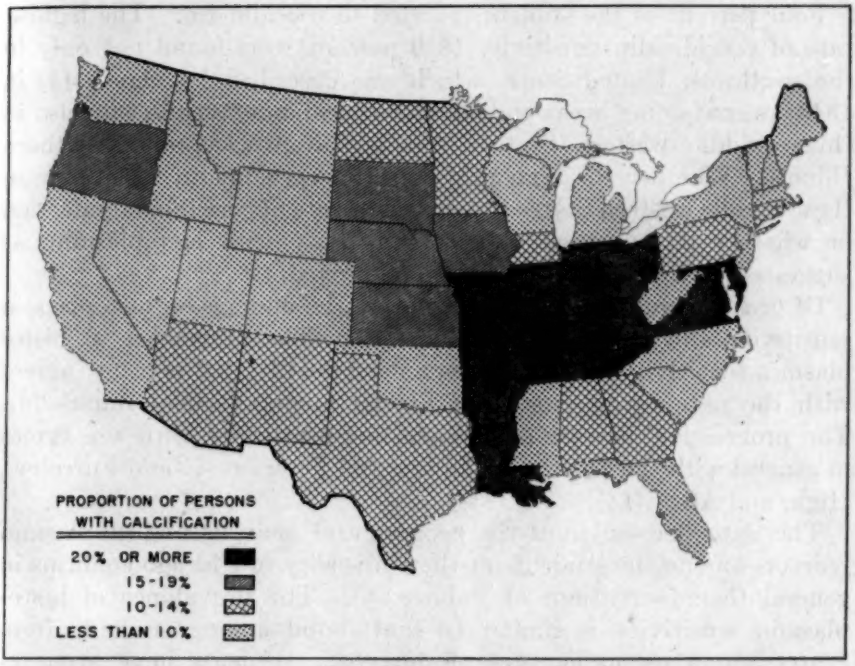

Figure 5. Pulmonary calcification rates observed in University of Chicago students from certain States and groups of States, 1947

the 6,000 students surveyed. An additional 102 persons (1.7 percent) were found with chest lesions other than infiltrations. These two groups are being followed and will be reported upon at a future date. In addition to these, 14 individuals with miliary pulmonary calcifications, and 13 individuals with unusually large hilar calcifications are being investigated at the present time and will be reported in detail later. A high percentage of those with such unusual calcifications have been reported to react to histoplasmin (*15, 16*). Among similar cases at Chicago, 85 percent were found to react to histoplasmin.

Discussion

The over-all prevalence of tuberculin sensitivity (26.1 percent) among the 6,000 students at the University of Chicago is comparable to the rate of sensitivity reported in other student population groups (*4, 7, 17, 18, 19, 20, 21*). The rate of pulmonary calcification among the tuberculin reactors was 14 percent, similar to the rate found by others (*1, 4, 14, 21*). Although there were scattered differences in the rate of pulmonary calcification among tuberculin reactors coming from different parts of the United States, it was by far the highest among Chinese males, 95 percent of whom reacted to tuberculin and showed a rate of 30.2 percent calcifications.

Four percent of the students reacted to coccidioidin. The highest rate of coccidioidin sensitivity (8–9 percent) was found not only in the southwest United States which was described by Smith (*2*) in 1943, as containing areas endemic for coccidioidomycosis, but also in three middle western States: Missouri, Kentucky, and Southern Illinois. Whether the high prevalence of coccidioidin sensitivity in these middle western States reveals a true rate of coccidioidal infection or whether it represents a cross sensitivity with histoplasmin, as suggested by Smith (*2*), remains to be proved.

Of greatest interest in the study were the findings on histoplasmin sensitivity and pulmonary calcifications. The prevalence of histoplasmin sensitivity among students aged 20–24 (18.0 percent) agrees with the nation-wide survey of Palmer among student nurses (*6*). The progressive increase of histoplasmin sensitivity with age agrees in general with the reports of Christie and Peterson (*7*) and Furcolow, High, and Allen (*14*).

The data derived from the geographical analysis of histoplasmin reactors among the students at the University of Chicago confirms in general the observations of Palmer (*6*). The prevalance of histoplasmin sensitivity is similar to that found among students from States where recent surveys of university students have been reported. Prior and Allen (*18*) reported an over-all prevalence of 47 percent among Ohio residents with a significantly lower prevalence in eastern Ohio. The rate found in this survey was 39 percent. Students at another Ohio university showed a prevalence of 36 percent histoplasmin sensitivity (*19*). A Pennsylvania survey (*20*) showed a prevalence of 11 percent as compared with 16 percent in this study. A survey of Wisconsin resident students (*21*) discovered 11 percent prevalence as against 8 percent found in this survey.

In general, our observations on the geographical distribution of the prevalence of pulmonary calcifications among the students agree with the findings of Long and Stearns of Army inductees which was limited to males (*5*). They found the highest prevalence in Tennessee (28 percent). In our study, the number of students from this State was small; however, 11 of 34 had pulmonary calcification. A significant difference was found between students from Northern and Southern Illinois, bearing out the findings of Long and Stearns (*5*). In our study, the prevalence of both histoplasmin and pulmonary calcifications in the students from Southern Illinois (56 and 31 percent respectively) was more than three times that among those from Northern Illinois and the Chicago vicinity (15 and 10 percent respectively). The rate of pulmonary calcifications among students who did not react to any of the three antigens (7.5 percent) is higher than that found in surveys of the United States as a whole (*4*), of Kansas

City (*14*), and of Wisconsin (*21*), but lower than the rates found in Tennessee (*7*, *22*).

Questions concerning the specificity and dose of the antigens [6] employed in this study and the relationship between sensitivity to these antigens in the presence of pulmonary infiltrates and calcifications have been reviewed by others (*23*, *3*, *7*, *24*, *25*, *26*, *27*). Efforts are being made to isolate coccidioides, histoplasma, and the tubercle bacillus from patients having non-calcified infiltrates. More investigations such as those recently made by Furcolow et al. (*28*) and by Bunnell and Furcolow (*29*) are needed to clarify the nature of early infections leading to histoplasmin sensitivity. No reports on the isolation of *H capsulatum* from the soil have been noted but its recovery from dogs, rats and mice (*30*) suggests animals as a possible source.

Summary

In summary, this report confirms the results of other recent surveys. A population of diverse origin was studied at a central epidemiological station. It was found that (*a*) the prevalence of tuberculin sensitivity progressively increased from 10 percent among the youngest age group to 57 percent among those 50 years of age; (*b*) the rate of histoplasmin sensitivity began at 10 percent among the youngest group and reached 38 percent in the oldest group; (*c*) pulmonary calcifications were associated with histoplasmin sensitivity twice as frequently as they were with tuberculin sensitivity; (*d*) the prevalence of both histoplasmin sensitivity and pulmonary calcifications was highest in the Lower Mississippi Basin of the United States.

ACKNOWLEDGMENTS

The authors are deeply indebted to Mrs. Ruth Quinlan, R. N., and Mrs. Agnes Robertson, R. N., for their considerable assistance in administering and interpreting the skin tests, and to Miss Jeanne Friedemann for her careful work in verifying the accuracy of the data submitted by the students.

REFERENCES

(*1*) Aronson, J. D., Saylor, R. M., and Parr, E. I.: Relationship of coccidioidomycosis to calcified pulmonary nodules. Arch. Path. **34**: 31–48 (1942).

(*2*) Smith, C. E.: Coccidioidomycosis. Med. Clinics N. America **27**: 790–807 (1943).

(*3*) Christie, A. and Peterson, J. C.: Pulmonary calcification in negative reactors to tuberculin. Am. J. Pub. Health **35**: 1131–1147 (1945).

(*4*) Palmer, C. E.: Nontuberculous pulmonary calcification and sensitivity to histoplasmin. Pub. Health Rep. **60**: 513–520 (1945).

(*5*) Long, E. R. and Stearns, W. H.: Physical examination at induction. Standards with respect to tuberculosis and their applications as illustrated by a review of 53,400 X-ray films of men in the Army of the United States. Radiology **41**: 144–150 (1943).

[6] A series of several hundred persons was recently tested with both 1-100 dilution of the Vanderbilt histoplasmin (supplied by Christie and Peterson) and 1-1000 H-15 histoplasmin (supplied by Howell of the Public Health Service). The results of this comparison, to be reported later, showed close similarity both in the intensity of reactions and in the number of individuals showing sensitivity.

(6) Palmer, C. E.: Geographic differences in sensitivity to histoplasmin among student nurses. Pub. Health Rep. **61:** 475–487 (1946).
(7) Christie, A. and Peterson, J. C.: Histoplasmin sensitivity. J. Pediat. **29:** 417–432 (1946).
(8) Nelson, W. E., Seibert, F. B., and Long, E. R.: Technical factors affecting the tuberculin test. J. A. M. A. **108:** 2179–2181 (1937).
(9) Smith, C. E., Whiting, E. G., Baker, E. E., Rosenberger, H. G., Beard, R. R., and Saito, M. T.: The use of coccidioidin. Am. Rev. Tuberc., **57:** 330–360 (1948).
(10) Furcolow, M. L., Hewell, B., Nelson, W. E., and Palmer, G. E.: Quantitative studies of the tuberculin reaction. I. Titration of tuberculin sensitivity and its relation to tuberculous infection. Pub. Health Rep. **56:** 1082–1100 (1941).
(11) Haynes, D. M. and Hess, W. I.: Cutaneous test with coccidioidin. Review of the literature and report of a series in Texas. J. Lab. and Clin. Med. **31:** 1317–1324 (1946).
(12) Van Pernis, P. A., Benson, M. E., and Hollinger, P. H.: Specific cutaneous reactions with histoplasmosis. J. A. M. A. **117:** 436–437 (1941).
(13) Aronson, J. D.: The purified protein derivative with special reference to the technique of tuberculin injections and the grading of reactions. Am. Rev. Tuberc. **30:** 727–732 (1934).
(14) Furcolow, M. L., High, R. H., and Allen, M. F.: Some epidemiological aspects of sensitivity to histoplasmin and tuberculin. Pub. Health Rep. **61:** 1132–1144 (1946).
(15) High, R. H., Zwerling, H. B., and Furcolow, M. L.: Disseminated pulmonary calcification. A report of 113 cases. Pub. Health Rep. **62:** 20–29 (1947).
(16) Sontag, L. W. and Allen, J. E.: Lung calcifications and histoplasmin-tuberculin skin sensitivity. J. Pediat. **30:** 657–667 (1947).
(17) Myers, J. A.: Tuberculosis control in colleges and universities. Proc. 24th Annual Meeting, Amer. Student Health Assn. Bull. **27:** 65–71 (1946).
(18) Prior, J. A. and Allen, M. F.: Geographic distribution of histoplasmin and tuberculin reactors among Ohio State University freshmen and student nurses training in Columbus, Ohio, hospitals. Pub. Health Rep. **62:** 1608–1617 (1947).
(19) Hudson, E. H., Moore, F. R., and Phillips, E. A.: Comparative sensitivity to histoplasmin and tuberculin in Ohio University students. J. Lancet, **68:** 142–147 (1948).
(20) Krug, E. S. and Glenn, H. R.: Comparative studies in tuberculosis and histoplasmosis among 2,000 students entering Pennsylvania State College, September 1947. J. Lancet **68:** 206–208 (1948).
(21) Dickie, H. A. and Clark, E. A.: Histoplasmin and tuberculin sensitivity in relation to pulmonary calcifications among University of Wisconsin students. Ann. Int. Med. **28:** 1087–1093 (1948).
(22) Christie, A. and Peterson, J. C.: Pulmonary calcification and sensitivity to histoplasmin, tuberculin, and haplosporangin. J. A. M. A. **131:** 658–660 (1946).
(23) Emmons, C. W., Olson, B. J.: and Eldridge, W. W.: Studies of the role of fungi in pulmonary disease. I. Cross reactions of histoplasmin. Pub. Health Rep. **60:** 1383–1394 (1945).
(24) Howell, A., Jr.: Studies of fungus antigens. I. Quantitative studies of cross-reactions between histoplasmin and blastomycin in guinea pigs. Pub. Health Rep. **62:** 631–651 (1947).
(25) Cross, F. W. and Howell, A., Jr.: Studies of fungus antigens. II. Preliminary report on the isolation of an immunologically active polysaccharide from histoplasmin. Pub. Health Rep. **63:** 179–183 (1948).
(26) Howell, A.: Jr.: Studies of fungus antigens. III. Sensitization of normal animals with skin test antigens. Pub. Health Rep. **63:** 595–601 (1948).
(27) Peterson, J. C. and Christie, A.: Histoplasmosis and pulmonary calcifications. Am. Rev. Tuberc. **57:** 361–366 (1948).
(28) Furcolow, M. L., Mantz, H. L., and Lewis, I.: The roentgenographic appearance of persistent pulmonary infiltrates associated with sensitivity to histoplasmin. Pub. Health Rep. **62:** 1711–1718 (1947).
(29) Bunnell, I. L. and Furcolow, M. L.: A report on ten proved cases of histoplasmosis. Pub. Health Rep. **63:** 299–316 (1948).
(30) Emmons, C. W., Bell, J. A., and Olson, B. J.: Naturally occurring histoplasmosis in *Mus musculus* and *Rattus norvegicus*. Pub. Health Rep. **62:** 1642–1646 (1947).

APPENDIX A

Histoplasmin sensitivity observed in University of Chicago students from certain States and and groups of States, by sex, 1947

Geographic unit	Tested	Total pos.	Rate	Males		Females	
				Tested	Pos.	Tested	Pos.
Mississippi	20	14	70.0	16	11	4	3
Missouri	132	92	69.7	104	77	28	15
Tennessee	34	23	67.6	22	16	12	7
Arkansas	29	19	65.5	21	15	8	4
Kentucky	50	29	58.0	34	23	16	6
Southern Illinois	116	65	56.0	74	46	42	19
Indiana	240	104	43.3	150	75	81	29
Kansas	75	31	41.3	51	25	24	6
Louisiana	30	12	40.0	20	8	10	4
Ohio	251	98	39.0	169	68	82	30
Oklahoma	44	15	34.1	36	12	8	3
Iowa	125	40	32.0	84	29	41	11
Maryland, Virginia, Delaware, and District of Columbia	86	27	31.4	47	19	39	8
West Virginia	33	10	30.3	21	6	12	4
Texas	100	30	30.0	71	24	29	6
Alabama	40	10	25.0	29	7	11	3
South Carolina	29	7	24.1	19	5	10	2
Michigan	163	27	16.6	119	23	44	4
Pennsylvania	161	26	16.1	112	22	49	4
South Dakota	31	5	16.1	18	4	13	1
Nebraska	57	9	15.8	39	5	18	4
Northern Illinois	1,926	290	15.1	1,337	211	589	79
Oregon	27	4	14.8	23	4	4	0
Florida	56	8	14.3	38	6	18	2
California and Arizona	141	17	12.1	95	12	46	5
Colorado and New Mexico	42	5	11.9	24	4	18	1
North Carolina	37	4	10.8	19	3	18	1
Massachusetts and Rhode Island	132	13	9.8	91	9	41	4
Montana and North Dakota	43	4	9.3	28	4	15	0
Minnesota	99	8	8.1	60	7	39	1
Wisconsin	125	10	8.0	91	9	34	1
New York	448	34	7.6	337	28	111	6
New Jersey	105	7	6.7	77	6	28	1
Washington	49	3	6.1	32	3	17	0
Georgia	40	2	5.0	29	1	11	1
Connecticut	54	2	3.7	42	2	12	0
Idaho, Nevada, Utah, and Wyoming	54	0	0	44	0	10	0
Maine, New Hampshire, and Vermont	19	0	0	13	0	6	0
Total	5,243	1,104	----	3,645	829	1,598	275

816879—49——3

APPENDIX TABLE B

Pulmonary calcification observed in University of Chicago students from certain States and groups of States, by sex, 1947

Geographic unit	Tested	Total calc.	Rate	Males		Females	
				Tested	Calc.	Tested	Calc.
Arkansas	29	10	34.5	21	8	8	2
Missouri	132	43	32.6	104	33	28	10
Tennessee	34	11	32.4	22	7	12	4
Southern Illinois	116	36	31.0	74	26	42	10
Indiana	240	65	27.1	159	48	81	17
Louisiana	30	8	26.7	20	6	10	2
Kentucky	50	13	26.0	34	8	16	5
Virginia	27	7	25.9	15	3	12	4
Ohio	251	56	22.3	169	42	82	14
Delaware, Maryland, and District of Columbia	59	12	20.3	32	8	27	4
Kansas	74	14	18.7	51	10	24	4
Oregon	27	5	18.5	23	5	4	0
South Dakota	31	5	16.1	18	3	13	2
Iowa	125	20	16.0	84	11	41	9
Nebraska	57	9	15.8	39	5	18	4
Pennsylvania	161	21	13.0	112	18	49	3
Georgia	40	5	12.5	29	3	11	2
New Mexico, Arizona, and Texas	117	13	11.1	84	8	33	5
Connecticut	54	6	11.1	42	6	12	0
North Dakota and Minnesota	118	12	10.2	71	8	47	4
Alabama	40	4	10.0	29	2	11	2
Northern Illinois	1,926	193	10.0	1,337	128	589	63
West Virginia	33	3	9.1	21	2	12	1
Florida	56	5	8.9	38	1	18	4
Wisconsin	125	11	8.8	91	8	34	3
New York	448	37	8.3	337	31	111	6
Montana and Idaho	36	3	8.3	24	2	12	1
Washington	49	4	8.2	32	4	17	0
Colorado	37	3	8.1	20	0	17	3
Michigan	163	13	8.0	119	8	44	5
Maine, New Hampshire, Vermont, and Rhode Island	27	2	7.4	21	1	6	1
California	129	9	7.0	86	7	43	2
South Carolina	29	2	6.9	19	2	10	0
Oklahoma	44	3	6.8	36	3	8	0
New Jersey	105	7	6.7	77	7	28	0
North Carolina	37	2	5.4	19	2	18	0
Mississippi	20	1	5.0	16	0	4	1
Massachusetts	124	4	3.2	83	2	41	2
Utah, Wyoming, and Nevada	42	1	2.4	37	1	5	0
Total	5,243	676	----	3,645	477	1,598	199

INCIDENCE OF DISEASE

No health department, State or local, can effectively prevent or control disease without knowledge of when, where and under what conditions cases are occurring

UNITED STATES

REPORTS FROM STATES FOR WEEK ENDED DECEMBER 18, 1948

A total of 264 cases of poliomyelitis was reported for the week, as compared with 345 last week, 197 in 1946, the largest for a corresponding week of the past 5 years, and a 5-year (1943–47) median of 108. Only 7 States reported more than 9 cases, and only California (90 cases, last week 122), reported more than 16 cases. The total to date is 27,281 as compared with 24,960 in 1946, the largest corresponding figure of the past 5 years, and 10,683, the least, reported last year.

A decline was reported in the incidence of influenza, from a total of 2,730 cases reported last week to 2,644 for the current week. Slight increases occurred in Virginia, South Carolina, Arkansas, and Arizona (aggregating 906 cases, last week 632). Texas reported 1,378 cases currently, last week 1,758. No other State reported more than 89 cases. The total since July 31 (approximate average seasonal low incidence week) is 31,284 cases, 5-year median for the same period 29,177.

A total of 5,984 cases of measles was reported for the current week, as compared with 6,280 last week and a 5-year median of 2,592. Decreases occurred in 6 geographic divisions reporting 4,487 cases (last week 5,250) of the current total, while increases were reported in the East South Central, Mountain, and Pacific areas with a current aggregate of 1,486 cases (last week 987). The total since September 4 (average seasonal low incidence week), is 39,196 cases, as compared with 48,757 reported in 1943, the largest corresponding figure of the past 5 years, and a 5-year median of 21,111.

During the week, 4 cases of psittacosis were reported, in California. North Carolina reported 2 cases of Rocky Mountain spotted fever, and 1 case was reported in Maryland.

Deaths recorded for the week in 92 large cities in the United States totaled 9,344, as compared with 9,316 last week, 9,525 and 9,268, respectively, for the corresponding weeks of 1947 and 1946, and a 3-year (1945–47) median of 9,525. The total for the year to date is 462,246, as compared with 463,746 for the same period last year.

Infant deaths during the week totaled 723, as compared with 666 last week and a 3-year median of 640. The cumulative figure is 33,468, as compared with 36,720 for the corresponding period last year.

Telegraphic case reports from State health officers for week ended December 18, 1948

(Leaders indicate that no cases were reported)

Division and State	Diphtheria	Encephalitis, infectious	Influenza	Measles	Meningitis, meningococcal	Pneumonia	Poliomyelitis	Rocky Mountain spotted fever	Scarlet fever	Smallpox	Tularemia	Typhoid and paratyphoid fever [a]	Whooping cough	Rabies in animals
NEW ENGLAND														
Maine			3	163		9			13			1	9	
New Hampshire				65					3					
Vermont				87			1		6				26	
Massachusetts	8	3		896	1	18			136				112	
Rhode Island				34		2			10			1	7	
Connecticut		2	2	57	2	46	2		37				2	
MIDDLE ATLANTIC														
New York	12		[b] 5	414	7	211	14		[c] 196			6	125	7
New Jersey	3		3	121	3	78			79			1	37	3
Pennsylvania	11		(b)	373	4		6		130			2	98	1
EAST NORTH CENTRAL														
Ohio	4		2	54	2	45	1		199		2	6	42	22
Indiana	11		7	27		22	1		60		7		22	22
Illinois			3	32	2	59	9		123		2	1	10	5
Michigan [d]	3		6	261	2	31	3		222			1	39	1
Wisconsin		1	10	173		5	14		63			1	26	
WEST NORTH CENTRAL														
Minnesota	2			10	1	5	15		62				9	
Iowa				4		3	15		24				4	
Missouri	3		15	95	2	7	4		31		2		4	
North Dakota	1			66			1		20					
South Dakota				1		2	16		8					
Nebraska			12	2			4		12					
Kansas	4		3	24		12	1		30				4	9
SOUTH ATLANTIC														
Delaware	1			3	1				6					
Maryland [d]	2			290	3	27		1	[c] 28			2	16	
District of Columbia				9		13			5				2	
Virginia	3		288	172		31	1		7		2	2	22	3
West Virginia	3		89	11		9	2		20			2	10	
North Carolina	15			119	2		4	2	43		3	1	15	
South Carolina	13		271	9	1	106	1		14			2	16	4
Georgia	16		10	8	1	11	1		38		3	3	3	2
Florida	16		1	30		15	1		4			2	4	6
EAST SOUTH CENTRAL														

South Carolina	13		271	9	1	106	1		14			2	16	4	
Georgia	16		10	8	1	11	1		38		3	3	3	2	
Florida	16		1	30		15	1		4			2	4	6	
EAST SOUTH CENTRAL															
Kentucky	15		1	121	3	22			65		1	1	18	8	
Tennessee	2		13	16	1	30	3		40		4		4		
Alabama	17		47	165	1	48	4		23			1	10	1	
Mississippi [d]	6	1	5	33		22			10		1	2			
WEST SOUTH CENTRAL															
Arkansas	8		178	149	1	31	3		14			3	14	1	
Louisiana	12		4	110	4	16	1		7		3	2	1	1	
Oklahoma	1	1	66	17	1	30	5		19			2		4	
Texas	19		1,378	712	5	165	13		24		1	2	85	34	
MOUNTAIN															
Montana				9			1		17				1		
Idaho	1		8	43		18			[e] 17				1		
Wyoming			14	17			1		5		1		2		
Colorado	1					15			26			1			
New Mexico		1	2	73		17	1		17		2	6	3		
Arizona	5		169			32	3		6				8		
Utah [d]				166		1	8		11				18		
Nevada				1			2								
PACIFIC															
Washington			8	211	1	2	4		47			1	14		
Oregon	1		6	261	1	21	8		25				8		
California	9		15	370	3	30	90		79			7	45	5	
Total	228	9	2,644	5,984	55	1,267	264	3	2,081	0	34	62	896		
Median, 1943–47	396	8	3,973	2,592	92		108	1	2,882	6	36	56	2,125		
Year to date 50 weeks	9,356	554	170,099	590,610	3,149		27,296	522	74,690	57	965	3,520	71,752		
Median, 1943–47	13,434	617	309,648	587,903	7,710		13,558	466	134,742	339	772	4,773	120,814		
Seasonal low week ends	(27th) July 10		(30th) July 31	(35th) Sept. 4	(37th) Sept. 18		(11th) Mar. 20		(32d) Aug. 14	(35th) Sept. 4		(11th) Mar. 20	(39th) Oct. 2		
Since seasonal low week	4,746		31,284	39,196	713		26,946		19,074	7		3,047	8,829		
Median, 1943–47	6,991		29,177	21,111	1,215		13,161		33,963	66		4,149	23,278		

[a] Including paratyphoid fever, reported separately, as follows: Maine 1; New York 1; Ohio 3; Illinois 1; Virginia 1; South Carolina 2; Georgia 2; Colorado 1; California 5. One case of Salmonella infection (not included) was reported in Massachusetts.

[b] New York City and Philadelphia, only, respectively.

[c] Including cases reported as streptococcal infection and septic sore throat.

[d] Period ended earlier than Saturday.

Psittacosis: California, 4 cases.

Alaska: No new cases to report.

Territory of Hawaii: Influenza 3; measles 320; whooping cough 7.

PLAGUE INFECTION IN YAKIMA COUNTY, WASH.

Under date of December 14, plague infection was reported proved in Yakima County, Wash., in a pool of 162 fleas from 147 short-tailed meadow mice, *Lagurus curtatus*, trapped Dec. 1, 1948, on the firing range, 10 miles northeast of Yakima.

FOREIGN REPORTS

CANADA

Provinces—Communicable diseases—Week ended November 27, 1948.—During the week ended November 27, 1948, cases of certain communicable diseases were reported by the Dominion Bureau of Statistics of Canada as follows:

Disease	Prince Edward Island	Nova Scotia	New Brunswick	Quebec	Ontario	Manitoba	Saskatchewan	Alberta	British Columbia	Total
Chickenpox		41	1	244	474	114	151	124	245	1,394
Diphtheria				12	7	3	2	1		25
Dysentery, bacillary				1		1				2
German measles				12	11			2	12	37
Influenza		13			1	5				19
Measles		56	3	156	116	102	7	31	46	517
Meningitis, meningococcal			1		1				1	3
Mumps		6	7	37	175	66	22	20	18	351
Poliomyelitis				1	5	3	1	1	2	13
Scarlet fever				129	60	4	9	9	5	216
Tuberculosis (all forms)		4	3	53	30	35	3		19	147
Typhoid and paratyphoid fever				4			3			7
Undulant fever				4	1				1	6
Venereal diseases:										
Gonorrhea	1	13	12	125	97	23	21	61	69	422
Syphilis	3	6	16	60	52	6	3		19	165
Other forms									1	1
Whooping cough		5	18	99	38	1	8	2		171

JAMAICA

Notifiable diseases—4 weeks ended November 27, 1948.—For the 4 weeks ended November 27, 1948, cases of certain notifiable diseases were reported in Kingston, Jamaica, and in the island outside of Kingston, as follows:

Disease	Kingston	Other localities	Disease	Kingston	Other localities
Cerebrospinal meningitis	1	2	Scarlet fever	1	1
Chickenpox	3	11	Tuberculosis (pulmonary)	39	56
Diphtheria	5	1	Typhoid fever	6	57
Erysipelas	1	1	Typhus fever (murine)		1

MADAGASCAR

Notifiable diseases—October 1948.—Notifiable contagious diseases were reported in Madagascar and Comoro Islands during October 1948 as follows:

Disease	October 1948			
	Aliens		Natives	
	Cases	Deaths	Cases	Deaths
Bilharziasis			163	0
Cerebrospinal meningitis			10	5
Diphtheria	3	0		
Dysentery:				
Amebic			295	6
Bacillary			1	0
Encephalitis, infectious			1	0
Erysipelas			10	0
Influenza	32	0	3,022	26
Leprosy			32	0
Malaria	392	0	30,283	209
Measles			112	0
Mumps	2	0	106	0
Plague			13	12
Pneumonia, broncho	1	0	237	43
Pneumonia, pneumococcic			567	71
Puerperal infection	1	0	1	0
Trachoma			1	0
Tuberculosis, pulmonary	7	1	92	28
Typhoid fever	2	0	16	3
Whooping cough			123	1

NORWAY

*Notifiable diseases—July-September 1948.**—During the months of July, August, and September 1948, cases of certain notifiable diseases were reported in Norway as follows:

Disease	Cases		
	July	August	September
Cerebrospinal meningitis	15	12	11
Diphtheria	28	30	56
Dysentery, unspecified	5	2	4
Encephalitis, epidemic	2	1	
Erysipelas	326	342	404
Gastroenteritis	4,198	4,629	3,587
Gonorrhea	402	453	407
Hepatitis, epidemic	101	111	152
Impetigo contagiosa	2,057	2,803	3,448
Influenza	1,099	1,400	2,331
Laryngitis	5,466	5,669	8,013
Malaria	1		2
Measles	1,568	973	1,046
Mumps	723	473	384
Paratyphoid fever	3		4
Pneumonia (all forms)	1,189	1,151	1,411
Poliomyelitis	58	128	122
Rheumatic fever	81	76	95
Scabies	1,428	2,187	2,635
Scarlet fever	153	197	481
Syphilis	86	84	119
Tetanus	1		
Tuberculosis (all forms)	314	280	343
Typhoid fever	1	4	3
Weil's disease	1	1	3
Whooping cough	362	490	545

*Report for June not received.

REPORTS OF CHOLERA, PLAGUE, SMALLPOX, TYPHUS FEVER, AND YELLOW FEVER RECEIVED DURING THE CURRENT WEEK

Note.—The following reports include only items of unusual incidence or of special interest and the occurrence of these diseases, except yellow fever, in localities which had not recently reported cases. All reports of yellow fever are published currently.

A table showing the accumulated figures for these diseases for the year to date is published in the PUBLIC HEALTH REPORTS for the last Friday in each month.

Plague

Indochina (French)—Laos State.—During the week ended December 4, 1948, 1 case of plague was reported in Vientiane, Laos State, French Indochina.

Smallpox

Egypt—Alexandria.—During the week ended November 27, 1948, 3 cases of smallpox were reported in Alexandria, Egypt.

Iraq—Basra.—During the week ended December 4, 1948, 14 cases of smallpox with 1 death were reported in Basra, Iraq.

Typhus Fever

Germany (United States Zone).—During the week ended November 20, 1948, 3 cases of typhus fever (murine type) were reported in the Bremen area in the United States Zone of Germany.

DEATHS DURING WEEK ENDED DEC. 11, 1948

[From the Weekly Mortality Index, issued by the National Office of Vital Statistics]

	Week ended Dec. 11, 1948	Corresponding week, 1947
Data for 92 large cities of the United States:		
Total deaths	9,386	9,894
Average for 3 prior years	9,899	
Total deaths, first 50 weeks of year	456,190	457,458
Deaths under 1 year of age	676	695
Average for 3 prior years	694	
Deaths under 1 year of age, first 50 weeks of year	33,080	36,405
Data from industrial insurance companies:		
Policies in force	70,772,413	66,993,558
Number of death claims	13,035	12,493
Death claims per 1,000 policies in force, annual rate	9.6	9.7
Death claims per 1,000 policies, first 50 weeks of year, annual rate	9.2	9.2

Regular Corps Examination for Nurse Officers

A competitive examination for appointment of nurse officers in the Regular Corps of the United States Public Health Service will be held on March 17 and 18, 1949.

Appointments will be made in the grades of junior assistant nurse officer (2d lt.), assistant nurse officer (1st lt.), and senior assistant nurse officer (capt.). Appointments provide opportunities for a career at Marine hospitals and in programs such as mental hygiene, nutrition, control of cancer, diabetes, heart disease, and tuberculosis.

Applicants for appointment in the grade of junior assistant nurse officer must be United States citizens, at least 18 years of age, graduates from approved schools of nursing with baccalaureate degrees, and currently registered as professional nurses. An applicant for appointment in the grade of assistant nurse officer must, in addition to the above requirements, be at least 21 years of age, and have had at least 7 years educational training and professional experience subsequent to high school. (Every applicant who, after July 1, 1943, has received a certificate in the nursing profession from an approved school, who applied for examination for appointment as a nurse officer in the assistant grade prior to January 1, 1953, and who has had, during the 5 years immediately prior to the date of such application, 4 years or more of experience as a nurse in the Army, Navy, or Public Health Service with a satisfactory record of active service, may substitute such certificate and experience for the required academic degree.) Applicants for the senior assistant grade must, in addition to the requirements for assistant grade, have had an additional 3 years or more of educational training or professional experience (a total of 10 years or more subsequent to high school). Qualifying applicants will receive written professional tests, an oral interview, and a physical examination.

The written examination will include general nursing, supervision of nursing practice, hygiene, communicable disease nursing. The examination will be held at the following cities: Baltimore, Norfolk, New Orleans, San Francisco, Seattle, Chicago, Cleveland, Detroit, Boston, Memphis, Kirkwood (Mo.), Staten Island, Los Angeles, Lexington (Ky.), Fort Worth, Kansas City (Mo.), Denver, Atlanta.

Entrance Pay (per annum)

Rank	Base pay	Rental and subsistence allowances (without dependents)	Total	Rental and subsistence allowances (with dependents)	Total
Junior assistant	$2,160.00	$795.50	$2,955.50	$1,231.00	$3,391.00
Assistant	2,400.00	975.50	3,375.50	1,411.00	3,811.00
Senior assistant	2,898.00	1,155.50	4,053.50	1,591.00	4,489.00

Application forms and additional information about extra benefits may be obtained by writing to the:

Surgeon General,
United States Public Health Service,
Washington 25, D. C.
Attention: Division of Commissioned Officers.

Completed applications must be received not later than February 17, 1949.

✦ ✦ ✦

The PUBLIC HEALTH REPORTS is printed with the approval of the Bureau of the Budget as required by Rule 42 of the Joint Committee on Printing.

The PUBLIC HEALTH REPORTS, first published in 1878 under authority of an act of Congress of April 29 of that year, is issued weekly by the Public Health Service through the Division of Public Health Methods, pursuant to the following authority of law: United States Code, title 42, sections 241, 245, 247; title 44, section 220.

It contains (1) current information regarding the incidence and geographic distribution of communicable diseases in the United States, insofar as data are obtainable, and of cholera, plague, smallpox, typhus fever, yellow fever, and other important communicable diseases throughout the world; (2) articles relating to the cause, prevention, and control of disease; (3) other pertinent information regarding sanitation and the conservation of the public health.

The PUBLIC HEALTH REPORTS is published primarily for distribution, in accordance with the law, to health officers, members of boards or departments of health, and other persons directly or indirectly engaged in public health work. Articles of special interest are issued as reprints or as supplements, in which forms they are made available for more economical and general distribution.

Requests for and communications regarding the PUBLIC HEALTH REPORTS, reprints, or supplements should be addressed to the Surgeon General, Public Health Service, Washington 25, D. C. Subscribers should remit direct to the Superintendent of Documents, Washington 25, D. C.

Librarians and others should preserve their copies for binding, as the Public Health Service is unable to supply the general demand for bound copies. Indexes will be supplied upon request.

✦ ✦ ✦

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D. C. : 1949

For sale by the Superintendent of Documents, U. S. Government Printing Office, Washington 25, D. C.
Price 10 cents. Subscription price $4.00 a year.